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| 09/926,785      | 12/19/2001  | Naoaki Ikeda         | 215410US2PCT        | 1675             |

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EXAMINER

DINH, JACK

ART UNIT PAPER NUMBER

2873

DATE MAILED: 09/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/926,785

Applicant(s)

IKEDA ET AL.

Examiner

Jack Dinh

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 8-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: **DETAILED ACTION**.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's submitted prior art in view of Motegi (U.S. Patent No. 5,353,292), and further in view of Katsuhiko (Japan Patent Publication No. 5-100267).

(a) Regarding claim 1, figure 9 of Applicant's submitted prior art is interpreted as disclosing a laser wavelength conversion apparatus 1 comprising a wavelength conversion element 2 for performing wavelength conversion of laser light entered from an entrance end surface and delivering laser light of a shortened wavelength from an exit end surface, a heater 4, a temperature sensor 5 for measuring the temperature of the wavelength conversion element, and a heater controller 10 for controlling an electric current supplied to the heater for heating so that the temperature detected by temperature sensor becomes a preset temperature. The Applicant's submitted prior art does not disclose the uniformity of the heater for heating the wavelength conversion element or the presence of the heat sink element having cooling fins. Within the same field of endeavor, Motegi is interpreted as disclosing a wavelength conversion apparatus comprising heaters for providing a uniform temperature distribution surround the wavelength

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conversion element (col. 5, lines 46-62; col. 8, lines 41-49). Motegi is interpreted as further disclosing that the apparatus comprising a heat sink for radiating the heat generated by the wavelength conversion element (col. 4, lines 48-55). Although Motegi does not specifically disclose the use of cooling fins for the heat sink element, cooling fins are well known in the art for radiating excessive heat. In addition, the Applicant's submitted prior art does not disclose that the wavelength conversion element is divided along a direction of an optical axis. Within the same field of endeavor, figure 1 of Katsuhiro is interpreted as disclosing the teaching of the plurality of wavelength conversion elements 1, 2, and 3 being divided along the direction of the optical axis. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide a heater and a heat sink element with cooling fins into the apparatus of prior art, as taught by Motegi, for the purpose of uniformly heating the wavelength conversion element and effectively radiating the heat generated by the wavelength conversion element, respectively, and to divide the wavelength conversion elements along the direction of the optical axis, as taught by Katsuhiro, for the purpose of decreasing the temperature gradient in the direction of the optical axis and curtail the decrease in the conversion efficiency.

(b) Regarding claim 10, figure 9 of Applicant's submitted prior art is interpreted as disclosing a laser wavelength conversion apparatus 1 comprising a means 2 for performing wavelength conversion of laser light entered from an entrance end surface and delivering laser light of a shortened wavelength from an exit end surface, a heating means 4, a means 5 for measuring the temperature of the means for performing wavelength conversion, and a means 10 for controlling an electric current supplied to the means for uniformly heating so that the

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temperature detected by the means for measuring the temperature becomes a preset temperature. The Applicant's submitted prior art does not disclose the uniformity of the means for heating the means for performing wavelength conversion or the presence of the means for retaining heat having cooling fins. Within the same field of endeavor, Motegi is interpreted as disclosing a means for performing wavelength conversion comprising a heating means for providing a uniform temperature distribution surround the wavelength conversion element (col. 5, lines 46-62; col. 8, lines 41-49). Motegi is interpreted as further disclosing that the apparatus comprising a heat-retaining means for radiating the heat generated by the means for performing wavelength conversion (col. 4, lines 48-55). Although Motegi does not specifically disclose the use of cooling fins for the heat retaining means, cooling fins are well known in the art for radiating excessive heat. In addition, the Applicant's submitted prior art does not disclose that the means for performing wavelength conversion is divided along a direction of an optical axis. Within the same field of endeavor, figure 1 of Katsuhiko is interpreted as disclosing the teaching of the plurality of wavelength conversion elements 1, 2, and 3 being divided along the direction of the optical axis. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide a heater and a heat sink element with cooling fins into the apparatus of prior art, as taught by Motegi, for the purpose of uniformly heating the wavelength conversion element and effectively radiating the heat generated by the wavelength conversion element, respectively, and to divide the wavelength conversion elements along the direction of the optical axis, as taught by Katsuhiko, for the purpose of decreasing the temperature gradient in the direction of the optical axis and curtail the decrease in the conversion efficiency.

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(c) Regarding claims 2 and 11, Applicant's submitted prior art in view of Motegi and further in view of Katsuhiro is interpreted as disclosing all the claimed limitations, as described above, except that the cooling fins located on side surfaces are arranged in such a state as to extend in a vertical direction. Whether the cooling fins are arranged in a vertical or horizontal direction to provide better cooling efficiency, it is not inventive to discover the optimum condition by routine experimentation because the modification would clearly be obvious within the capabilities of one skilled in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to include this limitation for the purpose of providing better efficiency for the heat sink element.

(d) Regarding claims 3, 4, 12 and 13 Applicant's submitted prior art in view of Motegi and further in view of Katsuhiro is interpreted as disclosing all the claimed limitations, as described above, except that the heating element comprising of rod-shaped heaters arranged at equal intervals or film-shaped heater. The selection of heater types and their placement being on the basis of suitability for the intended application would be entirely obvious. In addition, the applicant has produced no evidence tending to show superior results over the prior art because of the applicant's selection of heater types and their placement. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to select heater types and their placement for the purpose of uniformly heating the wavelength conversion element.

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(e) Regarding claims 5 and 14, Applicant's submitted prior art in view of Motegi and further in view of Katsuhiro is interpreted as disclosing all the claimed limitations, as described above, except that the heaters for temperature gradient correction are placed on the entrance and exit side of the heat sink and the heater controller provide higher heat generation for the entrance side compare to the surface side. As described above, the selection of placement for the heaters being on the basis of suitability for the intended application would be entirely obvious. In addition, Motegi discloses that to better improve the accuracy of the temperature control, the heaters may be controlled independently of each other (col. 8, lines 41-50). Furthermore, the applicant has produced no evidence tending to show superior results over the prior art. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide heaters for temperature gradient correction into the apparatus of prior art for the purpose of further improving the wavelength conversion.

(f) Regarding claims 6 and 15, Applicant's submitted prior art in view of Motegi and further in view of Katsuhiro is interpreted as disclosing all the claimed limitations, as described above, except for a loop gas pipe for blowing a cooling gas uniformly. Motegi clearly discloses in his invention the teaching of providing a uniform temperature distribution for a wavelength conversion apparatus by means of heating and cooling. Providing a loop gas pipe for blowing cooling gas would be one of numerous variations well known in the art for cooling purposes. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide a loop gas pipe for the purpose of uniformly cooling the wavelength conversion element.

(g) Regarding claims 8, 9, 16 and 17, Applicant's submitted prior art in view of Motegi and further in view of Katsuhiro is interpreted as disclosing all the claimed limitations, as described above, except that the end surfaces of the divided wavelength conversion element comprise a polished surface and is applied with an anti-reflection coating. However, since the light has to travel through multiple wavelength conversion elements, applying the anti-reflection coating or have the surfaces polished to reduce the reflection loss would be obvious within the knowledge of one skilled in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to apply an anti-reflection coating to or to polish the surfaces of the wavelength conversion elements for the purpose of decreasing the reflection loss of the incident light.

### ***Conclusion***

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Peterson et al. (U.S. Patent 6,374,906) and Nelik (U.S. Patent 6,377,455) discloses the fact that cooling fins are well-known for heat sink applications.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Dinh whose telephone number is (703) 605-0744. The examiner can normally be reached on M-T (8:30 AM - 6:30 PM).



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y Epps can be reached on (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JD  
August 25, 2003

A handwritten signature in cursive script, appearing to read "Georgia Y Epps".

Georgia Epps  
Supervisory Patent Examiner  
Technology Center 2800